REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHD-23-06

Advanced Imaging Tools to Identify Biological Mechanisms of Directed Energy Interaction

PROJECT DESCRIPTION: Visualizing the impacts of directed energy (DE) in living cells is a challenging endeavor, even with state-of-the-art imaging methods. The complex bioeffects which occur simultaneously at the physical, chemical, and biological level often require new or non-traditional methods of real-time sensing and imaging. My research group is focused on developing new imaging technologies to understand mechanisms of DE interaction at the cellular level. Current projects include 1) quantitative phase imaging combined with membrane channel blockers to isolate mechanisms of water flux across cellular membranes exposed to DE, and 2) 3D-printed microscopy tools to enable live fluorescence imaging of cells in extreme DE environments. Interns will have the opportunity to gain skills in microscopy, image processing, 3D printing, and cell biology, and will help identify new mechanisms of interaction between DE and cells.

ACADEMIC LEVEL: Bachelor's, Master's, PhD

DISCIPLINE NEEDED:

- Biomedical Engineering
- Biology
- Electrical Engineering

RESEARCH LOCATION: JBSA-Fort Sam Houston, San Antonio, Texas

RESEARCH MENTOR: Zachary Steelman, PhD
Biomedical Engineering, Duke University, 2020

Zach Steelman is a Research Biomedical Engineer in the Bioeffects Division at the Air Force Research Laboratory (AFRL), Airman Systems Directorate. He joined AFRL in 2022 after completing his PhD in Biomedical Engineering at Duke University, followed by a National Research Council postdoctoral fellowship with AFRL. He is the principal investigator on multiple research efforts which seek to leverage advanced imaging technologies to understand the biophysical, biochemical, and biological responses to directed energy at the cellular level. His work involves the development of novel imaging tools to better understand the complex interaction between directed energy and biology.
Photo courtesy of the U.S. Air Force Research Laboratory.